



## General

### Guideline Title

Practice guideline summary: use of fMRI in the presurgical evaluation of patients with epilepsy: report of the Guideline Development, Dissemination, and Implementation Subcommittee of the American Academy of Neurology.

### Bibliographic Source(s)

Szaflarski JP, Gloss D, Binder JR, Gaillard WD, Golby AJ, Holland SK, Ojemann J, Spencer DC, Swanson SJ, French JA, Theodore WH. Practice guideline summary: use of fMRI in the presurgical evaluation of patients with epilepsy: report of the Guideline Development, Dissemination, and Implementation Subcommittee of the American Academy of Neurology. *Neurology*. 2017 Jan 24;88(4):395-402. [56 references] [PubMed](#)

### Guideline Status

This is the current release of the guideline.

This guideline meets NGC's 2013 (revised) inclusion criteria.

## Recommendations

### Major Recommendations

Definitions of the levels of the recommendations (A, B, C, U) and classification of the evidence (Class I-IV) are provided at the end of the "Major Recommendations" field.

Is Functional Magnetic Resonance Imaging (fMRI) Comparable with the Current Standard (Intracarotid Amobarbital Procedure [IAP]) for Measuring Language Lateralization?

#### Recommendations

fMRI may be considered as an option in lateralizing language functions in place of IAP in patients with medial temporal lobe epilepsy (MTLE) (Level C), temporal epilepsy in general (Level C), or extratemporal epilepsy (Level C), although patients should be carefully advised of the risks and benefits of fMRI versus IAP during discussions of modality choice in each individual case. The evidence is unclear for patients with temporal neocortical epilepsy or temporal tumors (Level U).

Can fMRI Predict Postsurgical Language Outcomes in Patients with Epilepsy Undergoing Brain Surgery?

#### Recommendation

fMRI may be considered for predicting postsurgical language outcomes after anterior temporal lobe (ATL) resection for the control of temporal lobe epilepsy (TLE) (Level C).

## Is fMRI Comparable with the Current Standard (IAP) for Measuring Memory Lateralization?

### Recommendation

fMRI may be considered as an option to lateralize memory functions in place of IAP in patients with MTLE (Level C).

## Can fMRI Predict Postsurgical Verbal Memory Outcomes in Patients Undergoing Temporal Lobectomy?

### Recommendation

Presurgical fMRI of verbal memory or of language encoding should be considered as an option to predict verbal memory outcome in patients with epilepsy who are undergoing evaluation for left MTL surgery (Level B).

## Can fMRI Predict Postsurgical Nonverbal (Visuospatial) Memory Outcomes in Patients with Epilepsy Undergoing Medial Temporal Lobectomy?

### Recommendation

Presurgical fMRI using nonverbal memory encoding may be considered as a means to predict visuospatial memory outcomes in patients with epilepsy who are undergoing evaluation for temporal lobe surgery (Level C).

## Is There Sufficient Evidence in Terms of Diagnostic Accuracy and Outcome Prediction for fMRI to Replace the IAP (Wada Test) in Presurgical Evaluation for Epilepsy Surgery?

### Recommendations

#### *Language*

Presurgical fMRI may be used instead of the IAP for language lateralization in patients with epilepsy who are undergoing evaluation for brain surgery (Level C). However, when fMRI is used for this purpose, task design, data analysis methods, and epilepsy type (temporal vs extratemporal, lesional vs nonlesional) need to be considered. Of particular importance for patients with lesional epilepsy is the fact that only small numbers of participants with variable lesion size/location were included in previous studies.

#### *Memory*

fMRI of language and verbal memory lateralization may be an alternative to IAP memory testing for prediction of verbal memory outcome in MTLE (Level C). fMRI is not yet established as an alternative to the IAP for prediction of global amnesia in patients who have undergone anterior temporal lobe (ATL) surgery.

### Definitions

#### Classification of Evidence for Risk of Bias

#### *Diagnostic Accuracy Scheme*

#### Class I

A cohort study with prospective data collection of a broad spectrum of persons with the suspected condition, using an acceptable reference standard for case definition. The diagnostic test is objective or performed and interpreted without knowledge of the patient's clinical status. Study results allow calculation of measures of diagnostic accuracy.

#### Class II

A case-control study of a broad spectrum of persons with the condition established by an acceptable reference standard compared with a broad spectrum of controls, or a cohort study with a broad spectrum of persons with the suspected condition where the data were collected retrospectively. The diagnostic test is objective or performed and interpreted without knowledge of disease status. Study results allow calculation of measures of diagnostic accuracy.

#### Class III

A case-control study or cohort study where either persons with the condition or controls are of a narrow spectrum. The condition is established by an acceptable reference standard. The reference standard and diagnostic test are objective or performed and interpreted by different observers. Study results allow calculation of measures of diagnostic accuracy.

## Class IV

Studies not meeting Class I, II, or III criteria, including consensus, expert opinion, or a case report.

### *Prognostic Accuracy Scheme*

## Class I

A cohort study of a broad spectrum of persons at risk for developing the outcome (e.g., target disease, work status). The outcome is defined by an acceptable reference standard for case definition. The outcome is objective or measured by an observer who is masked to the presence of the risk factor. Study results allow calculation of measures of prognostic accuracy.

## Class II

A case-control study of a broad spectrum of persons with the condition compared with a broad spectrum of controls, or a cohort study of a broad spectrum of persons at risk for the outcome (e.g., target disease, work status) where the data were collected retrospectively. The outcome is defined by an acceptable reference standard for case definition. The outcome is objective or measured by an observer who is masked to the presence of the risk factor. Study results allow calculation of measures of prognostic accuracy.

## Class III

A case-control study or a cohort study where either the persons with the condition or the controls are of a narrow spectrum where the data were collected retrospectively. The outcome is defined by an acceptable reference standard for case definition. The outcome is objective or measured by an observer who did not determine the presence of the risk factor. Study results allow calculation of measures of a prognostic accuracy.

## Class IV

Studies not meeting Class I, II, or III criteria, including consensus, expert opinion, or a case report.

### Classification of Recommendations

A = Established as effective, ineffective, or harmful (or established as useful/predictive or not useful/predictive) for the given condition in the specified population. (Level A rating requires at least two consistent Class I studies.)\*

B = Probably effective, ineffective, or harmful (or probably useful/predictive or not useful/predictive) for the given condition in the specified population. (Level B rating requires at least one Class I study or two consistent Class II studies.)

C = Possibly effective, ineffective, or harmful (or possibly useful/predictive or not useful/predictive) for the given condition in the specified population. (Level C rating requires at least one Class II study or two consistent Class III studies.)

U = Data inadequate or conflicting; given current knowledge, treatment (test, predictor) is unproven.

\*In exceptional cases, one convincing Class I study may suffice for an "A" recommendation if 1) all criteria are met, 2) the magnitude of effect is large (relative rate improved outcome > 5 and the lower limit of the confidence interval is >2).

## Clinical Algorithm(s)

None provided

## Scope

## Disease/Condition(s)

Epilepsy

## Guideline Category

Diagnosis

Evaluation

Risk Assessment

## Clinical Specialty

Neurological Surgery

Neurology

Radiology

## Intended Users

Physicians

Psychologists/Non-physician Behavioral Health Clinicians

## Guideline Objective(s)

- To review available evidence and provide practitioners with evidence-based recommendations for the role of functional magnetic resonance imaging (fMRI) in epilepsy surgery evaluation and postsurgical outcome prediction
- To answer the following clinical questions:
  - Is fMRI comparable with the current standard (intracarotid amobarbital procedure [IAP]) for measuring language lateralization?
  - Can fMRI predict postsurgical language outcomes in patients with epilepsy undergoing brain surgery?
  - Is fMRI comparable with the current standard (IAP) for measuring memory lateralization?
  - Can fMRI predict postsurgical verbal memory outcomes in patients with epilepsy undergoing temporal lobectomy?
  - Can fMRI predict postsurgical nonverbal (visuospatial) memory outcomes in patients with epilepsy undergoing temporal lobectomy?
  - Is there sufficient evidence in terms of diagnostic accuracy and outcome prediction for fMRI to replace the IAP (Wada test) in presurgical evaluation for epilepsy surgery?

## Target Population

Patients with medial temporal lobe epilepsy (MTLE), temporal epilepsy (TLE), temporal neocortical epilepsy, and extratemporal epilepsy undergoing brain surgery

## Interventions and Practices Considered

- Functional magnetic resonance imaging (fMRI)
- fMRI in comparison with intracarotid amobarbital procedure (IAP)

## Major Outcomes Considered

- Concordance of functional magnetic resonance imaging (fMRI) and the intracarotid amobarbital procedure (IAP) in tests of language and memory lateralization
- Lateralization of language network activation versus lateralization of hippocampal activation as predictors of postsurgical language outcomes
- Accuracy of fMRI for prediction of postsurgical language and memory functions
- Preoperative and postoperative verbal and visuospatial memory function
- Functional connectivity and postsurgical outcome

## Methodology

## Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

## Description of Methods Used to Collect/Select the Evidence

A medical librarian searched MEDLINE, EMBASE, and Science Citation Index (using Web of Science) for relevant articles published from 1990 to April 2015. The key text and index words used in the search were "epilepsy," "epilepsy surgery," "brain tumor(s)," "brain malformation(s)," "cortical malformation(s)," "Wada test," "intracarotid amobarbital procedure," "electro-cortical mapping," "fMRI," "functional MRI," "outcomes," "memory," and "language."

The guideline panel included only peer-reviewed studies in humans that addressed diagnosis and prognosis. Appendix e-3 in the supplement (see the "Availability of Companion Documents" field) provides the complete search strategy.

The original search yielded 2,636 abstracts. Each abstract was reviewed for relevance by at least 2 panel members, who then deemed 172 abstracts possibly relevant; the corresponding articles were obtained for full-text review. Two panelists working independently of each other reviewed each article and selected 37 articles for full data extraction on the basis of the following criteria: number of epilepsy patients included per study  $n \geq 15$  (this a priori decision was made to eliminate as many underpowered studies as possible from the review process), relevance to the clinical questions previously listed, clearly described methods of data collection and analysis, original data presented, and comparison data with intracarotid amobarbital procedure (IAP), electrocortical mapping, or postoperative outcome measures presented. The guideline panel excluded case reports, meta-analyses, and editorials.

## Number of Source Documents

Thirty-seven articles were selected for full data extraction.

## Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

## Rating Scheme for the Strength of the Evidence

### Classification of Evidence for Risk of Bias

Diagnostic Accuracy Scheme

#### *Class I*

A cohort study with prospective data collection of a broad spectrum of persons with the suspected condition, using an acceptable reference standard for case definition. The diagnostic test is objective or performed and interpreted without knowledge of the patient's clinical status. Study results allow calculation of measures of diagnostic accuracy.

#### *Class II*

A case-control study of a broad spectrum of persons with the condition established by an acceptable reference standard compared with a broad spectrum of controls, or a cohort study with a broad spectrum of persons with the suspected condition where the data were collected retrospectively. The diagnostic test is objective or performed and interpreted without knowledge of disease status. Study results allow calculation of measures of diagnostic accuracy.

#### *Class III*

A case-control study or cohort study where either persons with the condition or controls are of a narrow spectrum. The condition is established by

an acceptable reference standard. The reference standard and diagnostic test are objective or performed and interpreted by different observers. Study results allow calculation of measures of diagnostic accuracy.

#### *Class IV*

Studies not meeting Class I, II, or III criteria, including consensus, expert opinion, or a case report.

#### Prognostic Accuracy Scheme

#### *Class I*

A cohort study of a broad spectrum of persons at risk for developing the outcome (e.g., target disease, work status). The outcome is defined by an acceptable reference standard for case definition. The outcome is objective or measured by an observer who is masked to the presence of the risk factor. Study results allow calculation of measures of prognostic accuracy.

#### *Class II*

A case-control study of a broad spectrum of persons with the condition compared with a broad spectrum of controls, or a cohort study of a broad spectrum of persons at risk for the outcome (e.g., target disease, work status) where the data were collected retrospectively. The outcome is defined by an acceptable reference standard for case definition. The outcome is objective or measured by an observer who is masked to the presence of the risk factor. Study results allow calculation of measures of prognostic accuracy.

#### *Class III*

A case-control study or a cohort study where either the persons with the condition or the controls are of a narrow spectrum where the data were collected retrospectively. The outcome is defined by an acceptable reference standard for case definition. The outcome is objective or measured by an observer who did not determine the presence of the risk factor. Study results allow calculation of measures of a prognostic accuracy.

#### *Class IV*

Studies not meeting Class I, II, or III criteria, including consensus, expert opinion, or a case report.

## Methods Used to Analyze the Evidence

### Systematic Review with Evidence Tables

## Description of the Methods Used to Analyze the Evidence

In a few cases, included articles appeared to include subsets of patients who were incorporated in previous publications. Where this appeared to be the case, only data from the most recent publication were examined, except when the earlier report included analyses not performed in the later report. Two panelists working independently of each other rated each of the included articles according to the American Academy of Neurology (AAN) diagnostic and prognostic classification of evidence schemes (see the "Rating Scheme for the Strength of the Evidence" field). Differences in ratings were arbitrated by a third panel member until a consensus among the 3 reviewers was achieved. Additional review of all included articles was performed by the study methodologist to confirm adherence to the classification scheme. Because it is unclear whether the results of fMRI studies can be combined for seizure foci in different brain localizations (owing to possible function reorganization), the articles were also reviewed to determine whether the results could be analyzed separately for patients with medial and lateral temporal (temporal neocortical), temporal (if not divided into medial and lateral), and extratemporal epilepsies. Table e-1 in the supplement (see the "Availability of Companion Documents" field) presents the evidence.

## Methods Used to Formulate the Recommendations

### Expert Consensus

## Description of Methods Used to Formulate the Recommendations

In 2009, the Guideline Development, Dissemination, and Implementation Subcommittee of the American Academy of Neurology (AAN)

appointed an 11-member panel that included neurologists, neurosurgeons, neuroscientists, a physicist, and a neuropsychologist with special expertise in neuroimaging or epilepsy, or both, and with experience in AAN guideline development. The panel followed the methods described in the 2004 AAN process manual (see the "Availability of Companion Documents" field) to develop this practice guideline.

The guideline panel linked the strength of recommendations (A, B, C, and U) (see the "Rating Scheme for the Strength of the Recommendations" field) to the strength of the evidence on the basis of the number of Class I, II, and III studies (see the "Rating Scheme for the Strength of the Evidence" field).

## Rating Scheme for the Strength of the Recommendations

### Classification of Recommendations

A = Established as effective, ineffective, or harmful (or established as useful/predictive or not useful/predictive) for the given condition in the specified population. (Level A rating requires at least two consistent Class I studies.)\*

B = Probably effective, ineffective, or harmful (or probably useful/predictive or not useful/predictive) for the given condition in the specified population. (Level B rating requires at least one Class I study or two consistent Class II studies.)

C = Possibly effective, ineffective, or harmful (or possibly useful/predictive or not useful/predictive) for the given condition in the specified population. (Level C rating requires at least one Class II study or two consistent Class III studies.)

U = Data inadequate or conflicting; given current knowledge, treatment (test, predictor) is unproven.

\*In exceptional cases, one convincing Class I study may suffice for an "A" recommendation if 1) all criteria are met, 2) the magnitude of effect is large (relative rate improved outcome > 5 and the lower limit of the confidence interval is >2).

## Cost Analysis

A formal cost analysis was not performed, and published cost analyses were not reviewed.

## Method of Guideline Validation

External Peer Review

Internal Peer Review

## Description of Method of Guideline Validation

Drafts of the guideline have been reviewed by at least 3 American Academy of Neurology (AAN) committees, a network of neurologists, *Neurology* peer reviewers, and representatives from related fields.

The guideline was approved by the Guideline Development, Dissemination, and Implementation Subcommittee on February 29, 2016; by the Practice Committee on March 10, 2016; and by the AAN Institute Board of Directors on October 18, 2016.

## Evidence Supporting the Recommendations

### Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

## Benefits/Harms of Implementing the Guideline Recommendations

## Potential Benefits

Appropriate use of functional magnetic resonance imaging (fMRI) and the intracarotid amobarbital procedure (IAP) for presurgical evaluation of patients with epilepsy

## Potential Harms

Harms of the alternative procedure (intracarotid amobarbital procedure [IAP])

## Contraindications

### Contraindications

Presence of metallic artifacts or claustrophobia may preclude functional magnetic resonance imaging (fMRI).

## Qualifying Statements

### Qualifying Statements

Refer to the "Clinical Context" section of the original guideline document for a discussion of the limitations of the evidence and unresolved issues.

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## Implementation of the Guideline

### Description of Implementation Strategy

An implementation strategy was not provided.

### Implementation Tools

Patient Resources

Quick Reference Guides/Physician Guides

Slide Presentation

For information about availability, see the *Availability of Companion Documents and Patient Resources* fields below.

# Institute of Medicine (IOM) National Healthcare Quality Report Categories

## IOM Care Need

Living with Illness

## IOM Domain

Effectiveness

Patient-centeredness

Safety

## Identifying Information and Availability

### Bibliographic Source(s)

Szaflarski JP, Gloss D, Binder JR, Gaillard WD, Golby AJ, Holland SK, Ojemann J, Spencer DC, Swanson SJ, French JA, Theodore WH. Practice guideline summary: use of fMRI in the presurgical evaluation of patients with epilepsy: report of the Guideline Development, Dissemination, and Implementation Subcommittee of the American Academy of Neurology. *Neurology*. 2017 Jan 24;88(4):395-402. [56 references] [PubMed](#)

### Adaptation

Not applicable: The guideline was not adapted from another source.

### Date Released

2017 Jan 24

### Guideline Developer(s)

American Academy of Neurology - Medical Specialty Society

### Source(s) of Funding

This guideline was developed with financial support from the American Academy of Neurology (AAN). Authors who serve as AAN subcommittee members or methodologists were reimbursed by the AAN for expenses related to travel to subcommittee meetings where drafts of manuscripts were reviewed.

### Guideline Committee

Guideline Development, Dissemination, and Implementation Subcommittee of the American Academy of Neurology (AAN)

### Composition of Group That Authored the Guideline

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## Financial Disclosures/Conflicts of Interest

### Conflict of Interest

The American Academy of Neurology (AAN) is committed to producing independent, critical, and truthful clinical practice guidelines (CPGs). Significant efforts are made to minimize the potential for conflicts of interest to influence the recommendations of this CPG. To the extent possible, the AAN keeps separate those who have a financial stake in the success or failure of the products appraised in the CPGs and the developers of the guidelines. Conflict of interest forms were obtained from all authors and reviewed by an oversight committee prior to project initiation. AAN limits the participation of authors with substantial conflicts of interest. The AAN forbids commercial participation in, or funding of, guideline projects.

### Disclosures

J. Szaflarski has served, in the past 2 years, as a consultant for GW Pharmaceuticals, Inc., Upsher-Smith Laboratories, Inc., Sage Pharmaceuticals, Inc., and Biomedical Systems, Inc.; has served or serves on the editorial boards of *Epilepsy & Behavior*, *Epilepsy Currents* (contributing editor), *Journal of Epileptology* (associate editor), *Journal of Medical Science*, *Folia Medica Copernicana*, *Restorative Neurology and Neuroscience* (associate editor), and *Conference Papers in Medicine*; has received funding for research from the US Department of Defense (DOD), US Food and Drug Administration, American Epilepsy Society, SAGE Pharmaceuticals, Inc., Eisai, Inc., UCB Pharmaceuticals, the National Institute of Neurological Disorders and Stroke of the NIH, the State of Alabama ("Carly's Law"), and the University of Alabama at Birmingham; and has served as an expert witness in legal proceedings. D. Gloss is an evidence-based methodologist of the American Academy of Neurology. J. Binder serves on the editorial boards of *Brain and Language*, *Brain Imaging and Behavior*, the *Journal of Neuroimaging*, *Frontiers in Auditory Cognitive Neuroscience*, the *Journal of Cognitive Neuroscience*, and *Neuropsychology* and receives funding for research from the NIH and the Medical College of Wisconsin. W. Gaillard reports support from Research Triangle International and grant support from the NIH, the Centers for Disease Control and Prevention, the DOD, the National Science Foundation (NSF), Citizens United for Research in Epilepsy, Pediatric Epilepsy Research Foundation, and BAND and serves on the editorial boards for *Epilepsia* and *Epilepsy Research*. A. Golby serves on the editorial boards of *Brain Imaging and Behavior*, the *Journal of Neuroimaging*, the *Journal of Cancer Translational Medicine*, and *NeuroImage: Clinical*; serves as an associate editor of *Neurosurgery*; and has received research funding from the NIH, Harvard Catalyst, and Koh-Young Technology, Inc. S. Holland reports grant support from 4 entities within the NIH (the National Institute of Neurological Disorders and Stroke, the National Institute of Mental Health, the Eunice Kennedy Shriver National Institute of Child Health and Human Development, and the National Institute on Deafness and Other Communication Disorders) and from the Schiff Family Foundation, the Schroth Family Foundation, the Fischer Family Foundation, and PNC Bank Foundation. J. Ojemann is a board member of Thermo Neuroscience, Inc.; receives funding from the NIH and the NSF; is a member of the Epilepsy Foundation Northwest professional advisory board; and serves on the editorial boards of *Neurosurgery* and the *Journal of Neurosurgery*. D. Spencer has served as an editor for *Neurology*® and the *Neurology* patient page; has received research support from NeuroPace, Inc.; and has given a deposition in a legal proceeding. S. Swanson has received support from the Epilepsy Foundation of America and the NIH and has served as an expert witness in civil and criminal legal proceedings. J. French receives New York University (NYU) salary support for consulting work on behalf of the Epilepsy Study Consortium for Acorda, Adamas, Alexza, Anavex, BioPharm Solutions, Cerecor, Concert Pharmaceuticals, Eisai, Georgia Regents University, GW Pharmaceuticals, Marinus, Monteris Medical, Nestlé Health Science, Neurelis, Novartis, Pfizer, Pfizer Neusentis Research and Development, Pronutria, Roivant Sciences, Sage Therapeutics, SciFluor Life Sciences, SK Life Science, Sunovion, Takeda, UCB, Inc., Upsher-Smith, Xenon Pharmaceuticals, Zogenix, and Zynherba; has received personal compensation for serving as associate editor of *Epilepsia*; received research grants from the commercial entities Acorda, Alexza, Eisai Medical Research, Lewis County General Hospital, Lundbeck, Pfizer, SK Life Science, Sunovion, UCB, Upsher-Smith, and Vertex; has received grants from the noncommercial entities Epilepsy Research Foundation, Epilepsy Study Consortium, Epilepsy Therapy Project, and the National Institute of Neurological Disorders and Stroke of the NIH; serves on the editorial boards

of *Lancet Neurology*, *Neurology Today*, and *Epileptic Disorders*; is scientific officer for the Epilepsy Foundation of America, for which NYU receives salary support; and has received travel reimbursement related to research, advisory meetings, or presentation of results at scientific meetings from the Epilepsy Study Consortium, the Epilepsy Foundation of America, Eisai, GW Pharmaceuticals, Marinus, Nestlé Life Sciences, Pfizer, Sage, SK Life Science, Takeda, UCB, Upsher-Smith, Zogenix, and Zynerba. W. Theodore is an employee of the National Institute of Neurological Disorders and Stroke of the NIH, which provides salary, travel, and research support; has served as co-editor-in-chief for *Epilepsy Research*, and on editorial boards for *Lancet Neurology*, *Neurology*, *Epilepsia*, *Acta Neurologica Scandinavica*, and *Neurotherapeutics*; and has received support from the International League Against Epilepsy for teaching in Zambia. Go to [Neurology.org](https://www.neurology.org)  for full disclosures.

## Guideline Endorser(s)

American College of Radiology - Medical Specialty Society

American Epilepsy Society - Disease Specific Society

## Guideline Status

This is the current release of the guideline.

This guideline meets NGC's 2013 (revised) inclusion criteria.

## Guideline Availability

A list of American Academy of Neurology (AAN) guidelines, along with a link to this guideline, are available from the [AAN Web site](#) .

## Availability of Companion Documents

The following are available:

- Practice guideline: use of fMRI in the presurgical evaluation of patients with epilepsy. AAN summary of practice guideline update for clinicians. Minneapolis (MN): American Academy of Neurology; 2017. 2 p. Available from the [American Academy of Neurology \(AAN\) Web site](#) .
- Practice guideline summary: use of fMRI in the presurgical evaluation of patients with epilepsy: report of the Guideline Development, Dissemination, and Implementation Subcommittee of the American Academy of Neurology. Data supplement (e-appendices, e-tables, e-references). Minneapolis (MN): American Academy of Neurology; 2017. Available from the [Neurology Journal Web site](#) .
- Practice guideline: use of fMRI in the presurgical evaluation of patients with epilepsy. Presentation slides. Minneapolis (MN): American Academy of Neurology; 2017. Available from the [AAN Web site](#) .
- American Academy of Neurology (AAN). Clinical practice guideline process manual, 2004 Ed. St. Paul (MN): American Academy of Neurology. 2004. 57 p. Available from the [AAN Web site](#) .

## Patient Resources

The following is available:

- Use of fMRI to prepare for brain surgery in epilepsy. AAN summary of practice guideline update for patients and their families. Minneapolis (MN): American Academy of Neurology (AAN). 2017. 3 p. Available from the [American Academy of Neurology \(AAN\) Web site](#) .

Please note: This patient information is intended to provide health professionals with information to share with their patients to help them better understand their health and their diagnosed disorders. By providing access to this patient information, it is not the intention of NGC to provide specific medical advice for particular patients. Rather we urge patients and their representatives to review this material and then to consult with a licensed health professional for evaluation of treatment options suitable for them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or

publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

## NGC Status

This NGC summary was completed by ECRI Institute on March 30, 2017. The information was verified by the guideline developer on April 27, 2017.

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## Disclaimer

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